is an important phenomenon in that of *x*-rays; experiments indicate that these rays are evidence of an electromagnetic disturbance, which therefore travels with the velocity of light, and is accompanied by molecular excitation. The mechanism of the production of *x*-rays appears to be a setting-up of electrostatic lines of induction, and a production of an electromagnetic wave or impulse; the stress in the medium reduces its resistance, and the *x*-radiations become less and less energetic after a certain interval the longer the Crookes' tube is excited. The behaviour of rarefied media to powerful electric stress is analogous to that of elastic solids to mechanical stresses; a so-called vacuum, which acts as an insulator for electromotive forces giving a spark of 8 inches in air (about 200,000 volts), breaks down under 3,000,000 volts. A single discharge with this voltage through highly rarefied media produces *x*-rays powerful enough to give a photograph of the bones of the hand in one-millionth of a second. During the discharge the apparent resistance of the medium is only a few ohms. In this case the medium seems completely to lose its elasticity, so to speak, and is ruptured, and the elastic solid analogy thus seems to elucidate the question of the electrical conductivity of the ether.

MR. D. E. HUTCHINS, Conservator of Forests at the Cape, recently read before the Cape Town Philosophical Society a paper showing the need and value of extending the area in the Colony at present under forest. Cape Colony stands far below other countries in its proportion of forest, though the climate of the country is such that it ought to have a percentage under forest at least equal to Germany. The following table shows the area under forest in the Colony compared with that in some other countries:—

Countries.	Area under forest in acres.	Percentage under forest of total area of country.
Russia in Europe	527,427,000	42
Sweden	42,366,000	42
Austria	46,856,000	31
Germany	34,350,000	26
Norway	18,920,000	25
India	140,000,000	25
France	20,750,000	16
Portugal	1,666,000	5
Great Britain and Ireland	2,790,000	4
Cape Colony	353,280	0·29

Mr. Hutchins suggests that plantations should be formed in districts within minimum rainfall limits of 15 or 20 inches per annum. The argument which will perhaps appeal most forcibly to Cape agriculturists is that while the total value of the fruit produced in Cape Colony is 100,000*l*., no less than 269,349*l*. have been paid for wood imported into the Colony during the last two years, nearly the whole of which would be produced in national forests covering an area of about 50,000 acres. That forests can thrive where agriculture is difficult or impossible, is shown by the steep richly-wooded slopes of the lofty Amatolas, the similarly beautiful forest with its gigantic yellow-wood trees in the barren Knysna country, and, perhaps most striking of all, the cedar trees of Clanwilliam, growing on the absolutely bare rocks of the stupendous Cedarberg Range; while at Genadendal an introduced tree, the cluster pine, hardier than any of the indigenous trees, is spreading itself self-sown up the rocky mountain-side, in spite of fires, drought, hot winds and climatic vicissitudes, that are too often the despair of the agriculturist.

A PAPER on the "Wanton Mutilation of Animals," contributed by Dr. George Fleming to the *Nineteenth Century* for March 1895, has been issued in separate form by the Royal Society for the Prevention of Cruelty to Animals. The paper shows that many mutilations of this kind can boast of a venerable antiquity, and are practised in many countries. The practice of removing a portion of the tails of certain breeds of dogs appears to have been instituted as a means for the prevention of rabies, the belief being that the sinew which followed the piece bitten off was a worm which produced madness. "Worming," which was performed upon dogs for the same purpose, consisted in the excision of the frænum of the dog's tongue, under the impression that it had something to do with madness. Ear-cropping of dogs has been carried on for two or three centuries. Horses are subjected to tail-docking, ear-cropping, nostril-slitting, and other unnecessary mutilations. The fashion of mutilating horses appears to have prevailed at a very early date in England, and may have been introduced from Germany or Scandinavia. Dr. Fleming's descriptions will assist in suppressing these cruel and useless practices.

MESSRS. WILLIAMS AND NORGATE'S Book Circular for October, and their latest list of second-hand books (No. 10), contain the titles of a number of volumes on scientific subjects.—A more elaborate catalogue, occupying 686 pp., is the new volume of "Naturae Novitates" just issued by Messrs. R. Friedländer and Son, Berlin. This publication not only contains classified lists of books in many languages on all branches of science, but the works named in it are indexed according to subjects and authors.

THE following official publications from our foreign possessions have reached us:—*The Central Africa British Gazette* (published at Zomba) for July 9, containing an interesting report on the cultivation of coffee, compiled by the Commissioner of Agriculture to the Hawaian Government; Report on the Botanic Gardens and Domains, New South Wales, for the year 1897, by the Director, Mr. J. H. Maiden; Annual Report of the Royal Botanic Garden, Calcutta, for the year 1897-98, by the Superintendent, Dr. D. Prain, chiefly occupied by a list of exchanges; *Bulletin* (No. 15) of Miscellaneous Information from the Royal Botanic Gardens, Trinidad, edited by the Superintendent, Mr. J. H. Hart, and consisting of a conspectus of the genera of Ferns and Fern-allies of the Colony, and a monograph of the Cyatheaceæ, comprising the genera *Alsophila* (14 sp.), *Hemitelia* (15 sp.), and *Cyathea* (25 sp.); *Circular*, Nos. 4-7, of the Royal Botanic Gardens, Ceylon, issued by the Director, Mr. J. C. Willis, in which the extension of the rubber cultivation in the island is advocated, especially that of the Parà rubber, *Hevea brasiliensis*, which is stated to be well suited to the climate of the low country in the south-west of Ceylon.

THE additions to the Zoological Society's Gardens during the past week include a Tantalus Monkey (*Cercopithecus tantalus*, ♂) from Lagos, presented by Mr. Arthur T. Warren; a Macaque Monkey (*Macacus cynomolgus*) from India, presented by Mr. H. W. Mote; two American Flying Squirrels (*Sciuropterus volucella*) from North America, presented by Mrs. Nias; a Bengalese Cat (*Felis bengalensis*) from the East Indies, presented by Mr. David J. Munro; a Ruddy Ichneumon (*Herpestes smithi*) from India, presented by Mr. J. Lyons; a Black-headed Lemur (*Lemur brunneus*) from Madagascar, deposited; an Eland (*Orias canna*, ♂), bred in France purchased.

OUR ASTRONOMICAL COLUMN.

THE ANDROMEDA NEBULA.—In this column (September 22, p. 515) we have previously referred to the telegram which informed us that M. Seraphimoff had discovered, near the centre of the nebula of Andromeda, a stellar-like condensation. Writing to the *Astr. Nachr.* (No. 3523), he states that the central condensation is no nebulous nucleus, but is quite a distinct star of magnitude 10-11. Measurements with a star of magnitude 11 in the neighbourhood showed that the observed

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object is exactly identical in position with that of the old nucleus.

M. Seraphimoff also mentions that an examination of all photographs, drawings and descriptions of this nebula shows that the central part was very seldom referred to as a small star. In the year 1885 numerous observations (*Astr. Nachr.*, vol. cxii.-cxv.) showed that the central portion had a different appearance to what it now has; at the present time the two small stars appear equally bright and sharp, and this has been corroborated by Profs. Backlund, Belopolsky and Morin.

That the central portion of this great nebula is variable there can be little doubt, but up to the present time only very small differences of intensities have been recorded.

Prof. Pickering, in a Harvard College *Circular*, No. 34, states that a comparison of photographs of the nebula taken with the 8-inch and 11-inch Draper telescopes on September 20 and 21, 1898, with similar photographs taken in 1893–96, fails to show the new stellated appearance.

ATLAS OF VARIABLE STARS.—In a recent number of the *Astr. Nachr.* (No. 3523), Dr. J. G. Hagen describes the arrangement of a new atlas of variable stars, which we hope will soon be published, as it promises to be a very useful addition to an astronomical observatory. When completed the chart will consist of five series, the first three showing, on separate sheets, the positions and neighbouring stars of variables with faint minima; the fourth series of charts is for variables observable with small instruments; and the fifth, for naked eye variables. The sample chart accompanying Dr. Hagen's notice gives one an idea of the completeness of the work undertaken. The zones included in the first three series are − 25° to 0°, 0° to + 25°, and + 25° to 90°, and will cover altogether 150 charts. These charts include a field of one square degree, with an inner square of half the sides. On the outer side of the small square only stars of the BD are inserted. In the inner square all stars are inserted which appear in a 12-inch with a magnifier of 45 and a measurable field of 0°·75.

The variable, with one exception, on each chart is situated in the middle, so that the observer will be able directly to recognise in his field of view which of the stars is the variable in question. Each chart, further, gives the coordinates of the variable for 1900, with the annual movements, and, in addition, the colour, type of spectrum according to Secchi's classification, and the magnitudes at maximum and minimum. We may mention that each chart will be mounted on good stiff cardboard, and being of a handy size can be held by or placed close to the observer at the eye end of the telescope.

In conclusion, it must be remembered that the publication of this fine series of working charts is a very costly affair, and would probably not have been accomplished had not the benevolent Miss Catherine Bruce taken her usual interest in the progress of astronomical science, and tendered considerable financial help to further the printing of them.

REMINISCENCES OF AN ASTRONOMER.—Prof. Simon Newcomb continues his reminiscences in the third of a series of articles to the October number of the *Atlantic Monthly*. He commences in this number with his visit to Paris to search among the old manuscripts of the Paris Observatory for early observations of occultations which had never been published. We may here point out how important it is to keep a record of every observation that is made, no matter whether at the time it be considered useful or not. The study of what may now seem apparently useless may, for all we know, in years to come, become of vital importance. Such was the case with the old observations of occultations made at the Paris Observatory. "The astronomers had no idea of the possible usefulness and value of what they were recording. So far as we can infer from their work, they made the observations merely because an occultation was an interesting thing to see; and they were men of sufficient scientific experience and training to have acquired the excellent habit of noting the time at which a phenomenon was observed." By means of these old observations "seventy-five years were added, at a single step, to the period during which the history of the moon's motion could be written. Previously this history was supposed to commence with the observations of Bradley, at Greenwich, about 1750; now it was extended back to 1675, and with a less degree of accuracy, thirty years further still."

Referring to a meeting of the Academy of Sciences which he attended four years later, he says: "In the course of the session a rustle of attention spread over the room, as all eyes were turned upon a member who was entering rather late. Looking towards the door, I saw a man of sixty, a decided blond, with light chestnut hair turning grey, a slender form, a shaven face, rather pale and thin, but very attractive and extremely intelligent features. As he passed to his seat hands were stretched out on all sides to greet him, and not until he sat down did the bustle caused by his entrance subside. He was evidently a notable.

"Who is that?" I said to my neighbour.

"'Leverrier.'"

Prof. Newcomb found Delaunay one of the most kindly and most attractive of men. "His investigation of the moon's motion is one of the most extraordinary pieces of mathematical work ever turned out by a single person. It fills two quarto volumes, and the reader who attempts to go through any part of the calculations will wonder how one man could do the work in a life-time."

After the death of Delaunay, who was drowned when out for a sail in a small boat, Leverrier was reappointed to his old place at the Paris Observatory, and to him, as Prof. Newcomb says, "belongs the credit of having been the real organiser of the Paris Observatory. His work there was not dissimilar to that of Airy at Greenwich; but he had a much more difficult task before him, and was less fitted to grapple with it."

LORD LISTER ON EXPERIMENTAL MEDICINE.

THE address delivered by Lord Lister at Liverpool on October 8, on the occasion of the opening of the Thompson-Yates Laboratories at the University College in that city, was briefly referred to in our report of the ceremony last week. The complete address is printed in the *British Medical Journal* of October 15, and is reproduced below. It is a statement as to the nature and value of the work to be carried on in the new laboratories, and a dignified vindication of the experimental method in medicine. The facts concerning experiments upon animals are so often presented to the public in a distorted form, that a calm exposition of the true ethical policy of vivisection, such as Lord Lister gives in his address, should have a most beneficial effect.

LORD LISTER'S ADDRESS.

My Lord Chancellor, my Lord Mayor, my lords, ladies, and gentlemen,—When I was honoured by the authorities of the Liverpool College with the request that I would open the Thompson-Yates Laboratories I little imagined that I was asked to take part in so imposing a ceremonial as the present. That it should have assumed such a character, that it should have attracted so large and brilliant a company, including not only many men from various and often distant parts of the country distinguished in medicine and other branches of science, but also noblemen, Church dignitaries, and persons eminent in literature and in politics, seems to me a matter of great importance, full of good augury for the future of the scientific practice of the healing art—in other words, treatment based on real knowledge as contrasted with the blind gropings of empiricism. We seem to have before us to-day clear evidence that the more cultured sections of the British public are becoming alive to the necessity for providing adequate means for the practical study of the sciences which are of the very essence of the knowledge that confers the power to recognise and treat disease. If an engineer is to qualify himself for detecting and correcting anything wrong in a machine of human construction, no verbal description or drawings will give him the requisite information; he must see and handle the details of the mechanism, and watch them at work. And it might seem the veriest common sense that the more practically familiar a man is with the structure and working of that marvellously complicated mechanism, the human body, the better fitted will he be to deal with its disorders. Yet obvious as such a consideration may seem, it is only in comparatively recent periods that its truth has been generally recognised. I am old enough to remember the years before the passing of the Anatomy Act, and I recollect being told as a child of the fiendish deeds of Burke and Hare, horrors which it would appear were needed to arouse a prejudiced and apathetic public to the imperious necessity of making it legally permissible for the intending surgeon to become acquainted in the only possible way, by

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